



STABICAPS™:

**THE PROVEN
SOLUTION FOR
MORE STABLE
SOFT GELS**

**SOFT GEL GELATINS WITH SUPERIOR
SHELL STABILITY AND API RELEASE GUMMIES**

When manufacturing soft gels, nutra- and pharmaceutical manufacturers sometimes experience shell cross-linking leading to stability issues. With StabiCaps, such stability issues can be overcome. Developed by Rousselot, the world's leading¹ gelatin producer, StabiCaps enables the production of capsules with reduced cross-linking. The new product consists of a range of specific gelatins offering shell stability and API release levels superior to those of standard gelatins. With StabiCaps, you can be confident of having an optimal gelatin type for your soft gel product.

The difference is clear

Rousselot
Functional Ingredients

ROUSSELOT® STABICAPS™

THE BENEFITS AND CHALLENGES OF USING GELATIN IN SOFT GELS

Soft capsules, commonly known as soft gels, are a very popular dosage form. They are used mainly to carry oil-based liquids or paste-like fills.

The main shell excipient used in soft gels is gelatin. Designed by nature, clean label, non-allergenic and neutral in taste, gelatin is favored for its high functional capabilities and full digestibility.

Gelatin capsules offer many advantages:

- They provide full protection of the API;
- They enhance API bioavailability;
- They perfectly mask unpleasant API tastes and odors;
- They are easy to swallow.



UNDERSTANDING CROSS-LINKING

Producing soft gels, however, can be challenging. Especially when working with specific fills, manufacturers may experience cross-linking issues that unfavorably affect the soft gel stability.

To understand how and why cross-linking occurs, Rousselot has conducted extensive research, identifying the parameters

Factors that trigger cross-linking:

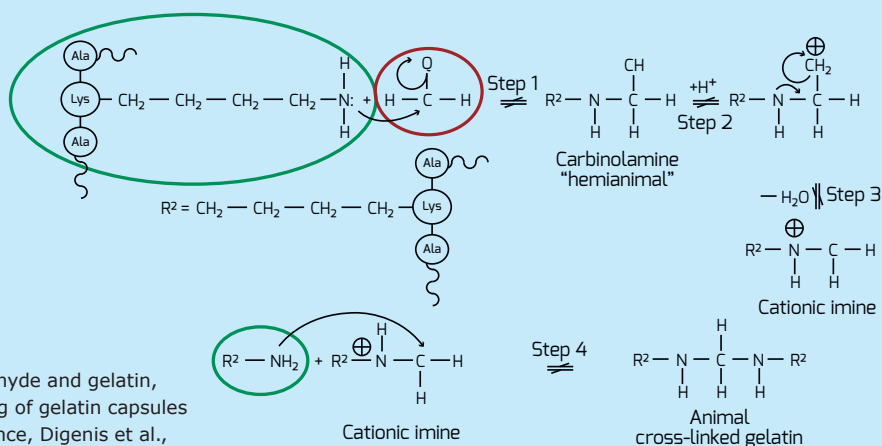
- Storage conditions in high temperature (>30°C) and humidity (>60%);
- API or nutraceutical fills containing aldehydes or antioxidants (polyphenols) that can be present in plant extracts;
- Complex fills (multivitamins, multi-minerals, metallic ions, or combinations of these).

The reactions involved are often enhanced by the characteristics of the gelatin: viscosity in relation to molecular weight distribution and pH can clearly play a role when it comes to cross-linking.

THE EFFECTS OF ALDEHYDES IN CROSS-LINKING

The most reactive components inducing cross-linking are aldehydes. In figure 1, formaldehyde reacts with the amino group of gelatin, forming an imine. When this imine reacts with another gelatin amino group, cross-linked gelatin is created.

Figure 1: Reaction scheme between formaldehyde and gelatin, leading to cross-linking. (source: Cross-linking of gelatin capsules and its relevance to *in-vitro-in-vivo* performance, Digenis et al., 1994)



PREDICTING THE BEHAVIOR OF GELATIN IN THE PRESENCE OF CROSS-LINKERS

In order to predict the behavior of gelatin in the presence of cross-linkers, Rousselot has developed a specific testing protocol.

This protocol consists of measuring viscosity over time in the presence of cross-linkers. The gelatin's cross-linking ability corresponds to the time it needs to reach the maximum viscosity value of a gelatin solution spiked with a cross-linker

“This specific predicting test is a major step towards a better understanding of gelatin behavior in the presence of cross-linkers.”

**The higher the reaction time,
the lower the sensitivity to cross-linking.**

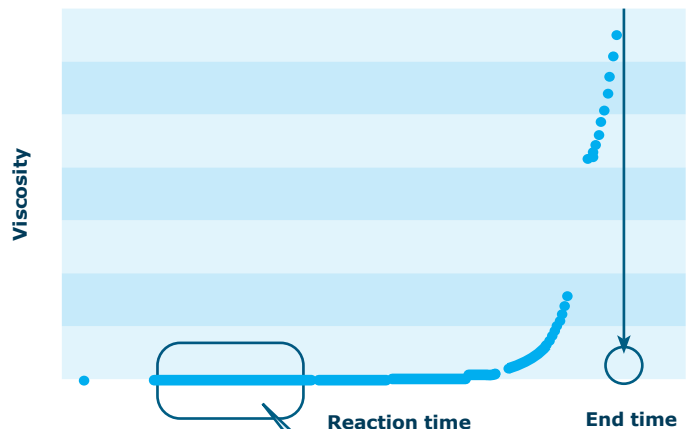


Figure 2: Measure of the viscosity over time. (Internal Rousselot study, EMEA Application Laboratory, 2017)

**The lower the reaction speed,
the lower the sensitivity to cross-linking.**

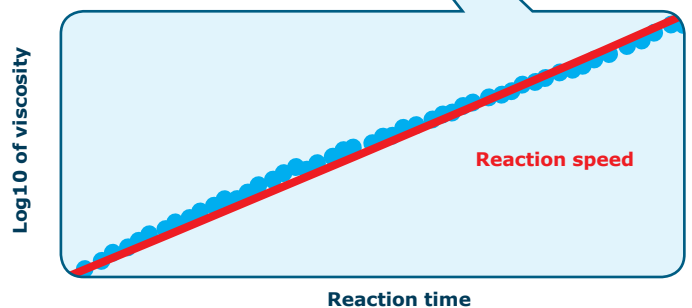


Figure 3: Slope of the linear part. Measure of viscosity increase in percentage, per hour (Internal Rousselot study, EMEA Application Laboratory, 2017)



GELATINS TAILORED TO PREVENT CROSS-LINKING IN SOFT GELS

Building on extensive in-house research into cross-linking, Rousselot has developed StabiCaps, a range of gelatins specifically tailored to prevent cross-linking in soft gels and thus to increase their stability.

The StabiCaps portfolio comprises two main grades:

- StabiCaps
- StabiCaps Plus for enhanced solutions (contains salts)

Both qualities have been engineered to display the perfect physical and chemical characteristics needed for limiting cross-linking.

StabiCaps is made from bovine raw materials.

SUPERIOR PERFORMANCE

As shown in the graph below, tests conducted on five different gelatin types clearly highlight their sensitivity in the presence of cross-linkers. The tests show StabiCaps' superiority over traditional soft gel gelatins. StabiCaps gelatin also clearly outperforms gelatins presented on the market as having reduced cross-linking properties.

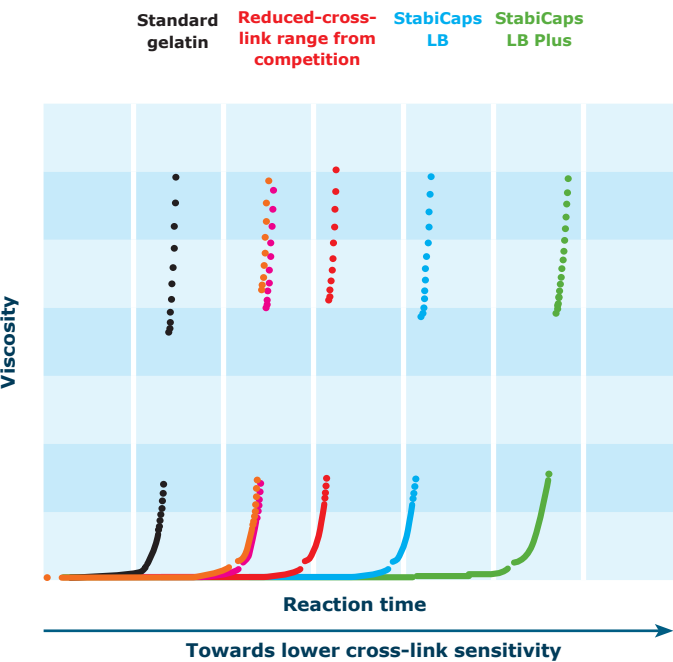


Figure 4: Sensitivity of market gelatins in the presence of cross-linkers (Internal Rousselot study, EMEA Application laboratory, 2017)

IMPROVED STABILITY

Tests on soft gel films in specific temperature & humidity conditions and in the presence of aldehydes have confirmed the capacity of the StabiCaps range to reduce cross-linking.

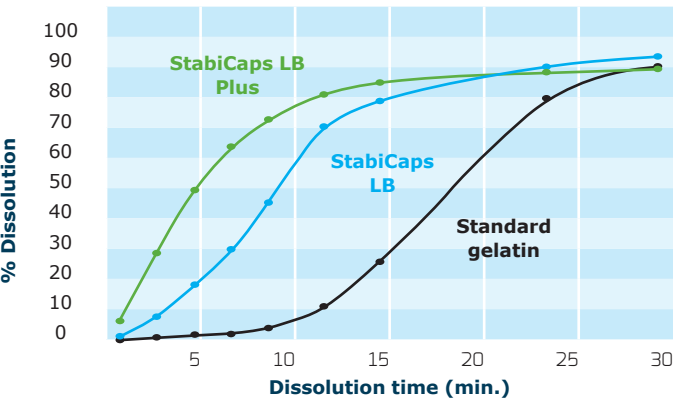


Figure 5: Dissolution after 6 month storage at 40°C and 75% humidity (Internal Rousselot study, EMEA Application Laboratory, 2017)

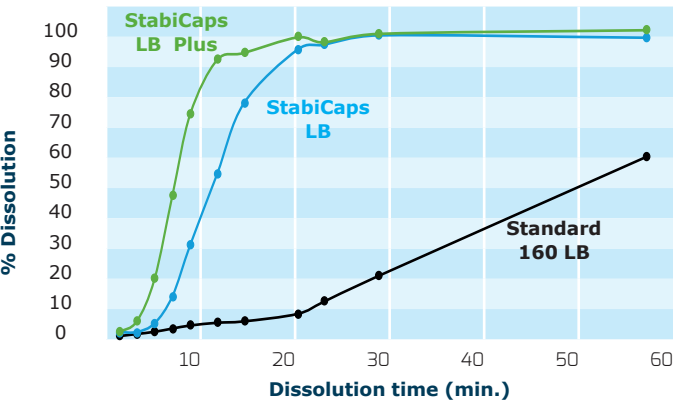


Figure 6: Dissolution after 6 month storage in the presence of a vitamin at 30 °C and 65% humidity (Internal Rousselot study, EMEA Application Laboratory, 2017)

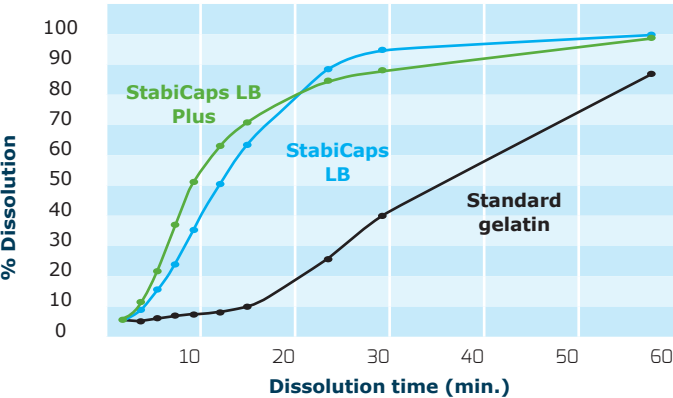


Figure 7: Dissolution after 6 month storage in the presence of an antioxidant at 30°C and 65% humidity (Internal Rousselot study, EMEA Application Laboratory, 2017)

KEY BENEFITS OF STABICAPS™, THE PERFECT SOLUTION FOR THE MOST REACTIVE FILLS:

- Reduced maturation time and faster drying time, improving production efficiency
- Perfect protection of active ingredients
- Optimal behavior in the presence of cross-linkers
- Optimal shell stability and shelf-life
- Optimal dissolution and API release

PATENTED TECHNOLOGY

StabiCaps is patented by Rousselot under the following number: WO 2018/016962 A1.

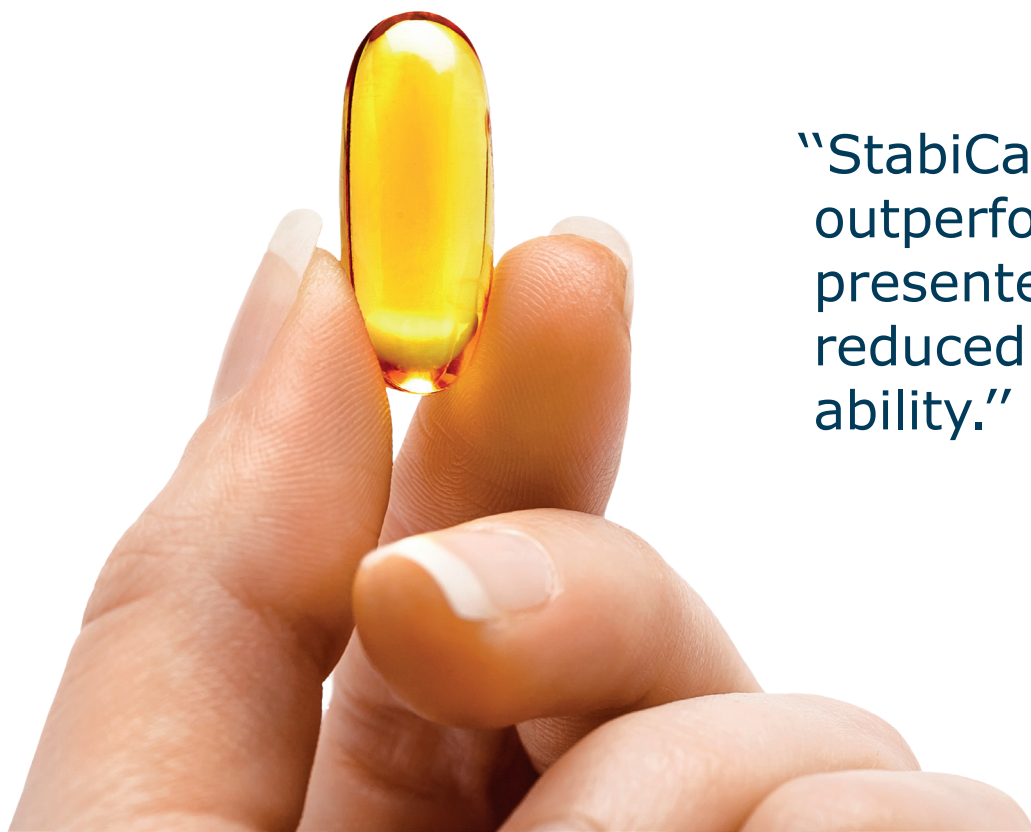
OUR EXPERTS CAN HELP

Creating a soft gel delivery system that fulfills the latest specifications and end-use requirements is a complex and highly challenging process. A deep understanding of the soft gel market and the capsule production process is key to choosing the correct gelatin for optimal formulation and efficient production. At Rousselot, we have leading-edge expertise in this field.

Our experts are more than eager to help you make all the right decisions.

REGULATORY COMPLIANCE

Rousselot StabiCaps gelatins comply with leading international pharmaceutical regulations, including the United States' and European pharmacopoeia. They also comply with edible regulations, including European Regulations (EC) N°853/2004 and N°2073/2005, Regulation EC N°629/2008 for Food Supplements and all the latest modifications in force at the date of issue of this document.



“StabiCaps clearly outperforms gelatins presented as having reduced cross-linking ability.”

OUR SALES OFFICES AROUND THE WORLD

EUROPE, MIDDLE EAST, AFRICA

europa@rousselot.com

Northern, Central and Eastern Europe, UK and Ireland

Rousselot B.V.
Meulestedekaai 81
9000 Gent Belgium
+32 9 255 18 18

France, Southern Europe, Middle-East, Africa

Rousselot S.A.S.
4 rue de l'abreuvoir
92400 Courbevoie France
+33 1 46 67 87 00

Spain and Portugal

Rousselot Gelatin S.L.
Paratge Pont de Torrent, S/N
17464 Cervia de Ter (Girona) Spain
+34 972 49 67 00

SOUTH AMERICA AND CENTRAL AMERICA

rousselot.brasil@rousselot.com

Brazil

Rousselot Gelatinas Do Brasil LTDA
Rua Santo Agostinho, N° 280
Distrito de Arcadas
CEP 13908-080
Amparo - São Paulo Brasil
+ 55 19 3907 9000

NORTH AMERICA AND MEXICO

gelatin.usa@rousselot.com

Rousselot Inc.
6737 W. Washington Street, Suite 2210
West Allis WI 53214 USA
+1 888 455 3556

CHINA

info@rousselotchina.com

Rousselot China
25/A, No. 18 North Cao Xi Road
Shanghai – PO: 200030 China
+86 21 6427 7337

JAPAN AND SOUTH KOREA

japan@rousselot.com

Rousselot Japan K.K.
Ishikin-nihonbashi Bldg, 6F
4-14-7 Nihonbashi-honcho, Chuo-Ku,
Tokyo 103-0023 Japan
+81 3 5643 7701

SOUTH EAST ASIA and Taiwan, Hong Kong, Australia, New Zealand, India and Sri Lanka

sea@rousselot.com

Rousselot (M) SDN. BHD.
Block P3-21, Plaza Damas
Jalan Sri Hartamas 1
50480 Kuala Lumpur Malaysia
+603 6201 8282

Your Rousselot sales contact information

About Rousselot® Functional Ingredients

A clean label ingredient with a long tradition, gelatin, is Rousselot's primary business and our world-class gelatins are leading the market. Designed by nature, Rousselot standard and specialty gelatins provide unmatched functional advantages, resulting in superior end-products for the consumers. Rousselot's gelatins are safe, come from sustainable sourcing, and answer consumers' concern for a preserved world. Rousselot Functional Ingredients works in partnership with the food, pharmaceutical and technical industries and helps them achieve their formulation and business goals. With us, "The difference is clear!"

Disclaimer All rights reserved. No part of this brochure may be reproduced, distributed or translated in any form or by any means, or stored in a database or retrieval system, without the prior written permission of Rousselot. Rousselot alone retains the copyright to the entire content of this brochure and the intellectual property rights to all designations of our products stated in this brochure and intellectual property rights to the products themselves. Nothing in this brochure constitutes a license (explicit or implicit) of any of Rousselot's intellectual property rights. The duplication or use of product designations, images, graphics and texts is not permitted without Rousselot's explicit prior written consent. Rousselot makes no representation or warranty, whether expressed or implied, of the accuracy, reliability, or completeness of the information, nor does it assume any legal liability, whether direct or indirect, of any information. Use of this information shall be at your discretion and risk. Nothing herein relieves you from carrying out your own suitability determinations and tests and from your obligation to comply with all applicable laws and regulations and to observe all third party rights. This product is not intended to diagnose, treat, cure, or prevent any disease. You should always consult your medical provider when using the product together with medical treatments, diets or fitness programs. The uses and claims for Rousselot's products recommended in the brochure should be adapted to the current local regulatory environment. This statement has not been evaluated by the Food and Drug Administration.

 @RousselotFi

 Rousselot

rousselot.com/functional

Rousselot Headquarters

Rousselot B.V.
Kanaaldijk Noord 20
5681 NM Son
The Netherlands

+31 499 364 100
collagen@rousselot.com